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eyes when the sun is low. As the red Florideae are colored in complement to the green-blue rays least weakened by traversing sea water, so the green and yellow of chlorophyll are complementary to the red and blue that traverse the atmospheric sea. It thus appears that the yellowish green of vegetation is really an adaptation to the composition of diffuse light.

Various lines of reflection, more or less closely related to this idea, are elaborated, such as, Regulation of the absorption of the sun's rays; Variable content of chlorophyll in nutritive organs; Biology of non-green algae; Etiolation, autumnal yellowing, and their biological significance.

The book is almost purely philosophical, only a few experiments, and these avowedly superficial, being recorded. Of course the general thesis does not touch the fundamental reason for plant coloration, and it is doubtful whether there is any logical gain in this mode of looking at the facts. To give it validity, it must be shown that the absorption of other rays by different pigments (and consequently a different colored vegetation) would be nutritively inefficient. Considering the fact that most plants get far more energy than they can use at ordinary temperatures, by reason of the inadequate supply of CO_2, it would surely be difficult to show this.—C. R. B.

MINOR NOTICES

Bacterial classification.—JENSEN has attacked the difficult problem of bacterial classification with a view to making a "natural system," that is, one which will express relationship by descent.[6] Most attempts to classify bacteria have been based first upon form or upon mode of cell division, and then upon physiologic characters. This method has led to many anomalies. For example, in one sharply defined family, the red sulfur bacteria, there are found rod, spiral, and round forms; and in the case of certain species of Crenothrix and Azotobacter, division occurs first in one, later in three planes. JENSEN argues that bacteria with a single flagellum, or with tufts of polar flagella, are closely allied, but that these are sharply differentiated in fermentative as well as other reactions from those having flagella distributed over the cell-body. Hence he divides the whole bacterial kingdom into two orders: (1) Cephalotrichinae and (2) Peritrichinae. In the former he groups seven families, in the latter four families. For genera he selects, as a means of discrimination, the oxidizing, reducing, fermentative, and other chemical processes of metabolism, as shown by the work of himself, WINOGRADSKY, BEIJERINCK, KASERER, BURRI and STÜTZER, MOLISCH, OMELIANSKI, BÜCHNER, and others. JENSEN regards the genus Methanomonas as the origin of all organic life, since this autotrophic, monotrichial, rodlike form builds up its cell substance in the simplest manner possible, without requiring either organic carbon, organic nitrogen, or outside energy such as light or heat. On the contrary, a certain amount of energy is actually set free during the metabolic process of *Methanomonas methanicus*. From this genus evolution progresses in four directions, toward the Protozoa, the Eumycetes, the Cyanophyceae, and toward the putrefying and pathogenic forms. The tree of descent thus outlined is ingenious, and species seem to fall into places of natural relationship. This, however, may only mean that generic distinctions are founded on well-established biological properties, for it is probable that bacteriologists will hesitate to accept a primary division into orders on a basis of the distribution of flagella.—MARY HEFFERAN.

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[6] JENSEN, O., Die Hauptlinien des natürlichen Bakteriensystems nebst einer Uebersicht der Gärungsphänomena. 8vo. pp. 42. *fig. 1.* Jena: Gustav Fischer. 1909. *M* 1.

Botanical directory.—A third edition of DÖRFLER'S *Adressbuch* was issued some months ago.[7] It is needless to commend this useful volume to those who know the earlier editions; but we do a real service to any who do not by directing their attention to the greatly improved third edition. The list of botanists with their addresses and specialties is of course the main feature; but very useful also are the lists of botanical periodicals and societies.

If any fault is to be found with the directory it is because it includes too much rather than too little. For example, we would have spared gladly the 270 pages of so-called "bibliography"—really a trade catalogue; but perhaps the author, who is also the publisher, could not afford (financially) to leave it out.

Further, there are too many names included. How to sift the real botanists from the tradesmen and notoriety seekers is a difficult problem; for some of our best-known but heedless botanists have not responded to the circulars of the editor, and many of the sham botanists have. Judging by the United States list the numbers might be reduced 50 per cent., for everybody knows that there are not in this country half of the 1800 listed who ought to be in a botanists' directory. We may suggest to the author the possibility of securing the cooperation of one or more editors in each country to purge the list. Why would not the issuance of this directory as an annual be a good work for the *Association internationale des botanistes?* Certainly it cannot be much of a money-making venture, and no doubt the editor would be glad of support. He is certainly entitled to great credit for the labor he has expended and the risk he has assumed in issuing this indispensable volume.—C. R. B.

Mechanics of plants.—Those who desire a compact and authoritative statement of SCHWENDENER'S present views on the mechanics of plants, as set forth in a course of special lectures given regularly for advanced students in the summer semester at Berlin, will find them in a thin volume[8] recently published by Profes-

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[7] DÖRFLER, J., Botaniker-Adressbuch. Sammlung von Namen und Adressen der lebenden Botaniker aller Länder, der botanischen Gärten und der die Botanik pflegenden Instituten, Gessellschaften und periodischen Publikationen. Dritte neu bearbeitete und vermehrte Auflage. 8vo. pp. viii+450. Wien: The author (III, Barichgasse 36). 1909. $3.35.

[8] HOLTERMANN, CARL, SCHWENDENER'S Vorlesungen über mechanische Probleme der Botanik, gehalten an der Universität Berlin. 8vo. pp. vi+134. With portrait of SCHWENDENER and *90 figs*. Leipzig: Wilhelm Englemann. 1909. *M* 3.60.